

**National Library Service
for the Blind and
Physically Handicapped**

The Library of Congress

Approved by Director, NLS/BPH

[Signature]

Date 11/06/97

Specification: #102

Title: E-1 Easy Cassette Machine

Date: November 1997



Technical Certification

[Signature]
Engineering

6 Nov 97
Date

[Signature]
Quality Assurance

11/5/97
Date

[Signature]
Chief, MDD

6 Nov 97
Date

BACKGROUND

The National Library Service for the Blind and Physically Handicapped (NLS) of the Library of Congress administers a free library service to eligible residents of the United States and citizens living abroad who cannot hold, handle, or read traditional print media because of visual or physical handicaps.

Using federal funds, NLS annually publishes approximately 2,000 books and 70 magazines on cassettes, on discs, and in braille. Titles are selected to appeal to a wide variety of interests, and copyright permission is obtained from authors and publishers. Books and magazines are narrated and duplicated at a high-quality professional standard. The quantity produced of any title is dependent on anticipated reader demand.

Playback machines and their accessories are designed to facilitate convenient use by handicapped people and to provide maximum reliability under environmental conditions that are sometimes harsh and handling that may be technically unsophisticated or inadvertently abusive. The equipment plays program materials at noncommercial speeds: 8-1/3 rpm for discs and 15/16 ips, 4-track for cassettes. All materials and equipment in the program can be sent to users and returned to libraries postage free.

A cooperating network of 56 regional libraries and more than 100 subregional libraries circulates recorded and braille books to some 700,000 adults and children out of a potential three million eligible population. Magazine subscriptions are provided on a direct-mail basis from the manufacturers. Users must generally deal with service centers in distant cities with communication by mail or phone and little or no personal contact. Everything comes and goes through a mail-order system. Fifty percent of the users are over sixty-four years old, and many depend on the NLS program for their major source of entertainment and connection with the world; 95 percent read recorded materials, 5 percent read braille.

Users are informed about new books, magazines, and services through bimonthly publications, annual catalogs, and subject bibliographies produced by NLS, and through various publications produced and circulated by the regional and subregional libraries.

USER MATERIALS

Contractors who consider submission of a bid to produce books, equipment, or other program products should be cognizant of the consumer-responsive nature of the program, and that the specifications for these products have been developed to meet the special reader needs in the program. Materials are produced with those reader needs foremost in mind, and improved through constant monitoring and consumer input. Contractors are expected to familiarize themselves with the equipment-handling practices of blind and physically handicapped clientele and ensure that the equipment they produce will stand up under this type of use. A high degree of quality workmanship and product reliability is mandated by the product specification.

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1. SCOPE

This specification establishes performance, design and test requirements for AC operated, portable, 15/16 ips automatic track switching, automatic deck reversal, 4-track monaural cassette players (Model E-1) used in the Library of Congress talking book program, for blind and physically handicapped readers. Machine performance and operation is microprocessor controlled by a programmable read-only memory integrated circuit (PROM IC). Operation of the machine is designed to be as easy as possible. While the controls on the side of the machine are to be functioning, they are to be covered in manufacture. The cover is designed for removal to allow those who desire to use these functions to do so. In most cases, the functions will not be used. In manufacture, the machine will be shipped in the automatic play mode. Following is a list of programmed functions and special features. Those not accessible due to the cover plate are marked N/A.

- A. The E-1 offers a choice of two Play modes:
 - 1. Automatic: Unit automatically plays through all recorded sides and stops at the end of the last side.
 - 2. Manual: Unit plays to the end of a side and stops. User initiates side changes. (N/A)
- B. Side switching handled by three systems:
 - 1. End of Signal Sensor (EOS) switches sides after 12 seconds of no signal in both the side playing and in the side to be played next. Side switching only occurs in Automatic Play mode.
 - 2. Mechanical End of Tape Sensor (MEOT) switches sides when the physical end of the tape is reached. MEOT provides a backup to the EOS. Side switching only occurs during Automatic Play mode.
 - 3. Side button allows user to initiate side advance at any time during either Play mode. It is the only way to switch sides in the Manual Play mode. (N/A)
- C. Upon initial loading, the cassette is automatically rewound to the beginning of Side 1. May not be user bypassed.
- D. At the end of the last side, the cassette is automatically rewound to the beginning of Side 1, when volume/start-stop slide control is set to stop position.
- E. If power is removed from the unit, side memory will be retained by a lithium battery, to allow playing to resume where interrupted when power is restored.
- F. Most operations can be interrupted by opening the door or sliding the volume control to STOP; the operation will resume

when the door is closed or the volume control is returned to VOLUME.

G. There are four separate user information tones:

1. "A" Tone: Occurs at end of tape play in either mode, at end of side in Manual Play mode (N/A), and when auto rewinding is completed. This tone informs the user to take some appropriate action. This tone is a 1/2 second, 523 Hz tone.
2. "B" Tone: Occurs when Side button is pushed and released within two seconds, when side information is desired (N/A). This tone informs the user of the side number. It is one or more 1319 Hz tones.
3. "C" Tone: Occurs when a tape is rewound to the beginning of the side using the review button, or when side button (N/A) is depressed for more than two (2) seconds during play, at end of side or at end of last side. It is a continuous 523 Hz tone that is clock-pulsed.
4. "D" Tone: Occurs at the end of the last side recorded on the cassette. It is a two (2) second 523 Hz tone.
5. "E" Tone : Occurs when the review button is partially depressed or when the volume control is improperly positioned. When the review button is released or volume control is moved to a proper position, the "E" tone will cease. The "E" tone alternates between 659 Hz-784 Hz.

H. Manual review operates in either mode, but only when a tape is playing.

I. In Automatic mode, this is an auto-reverse deck. In Manual mode, the user initiates the reversal. (N/A)

J. The user may switch from Automatic to Manual mode (N/A) or vice versa, at any time.

K. The unit may be operated with only one control: the Volume/Stop slide. The Review and Side buttons, and the Manual/Automatic switch add flexibility to the basic operation. (Side button and Manual/Automatic switch are N/A)

L. The Side button may be used to cycle through the tape repeatedly, i.e., from Side 1 to 2 to 3 to 4 to 1 to 2, etc. (N/A)

M. The door must be completely closed for the unit to operate.

N. The spindles are covered by the door to prevent the user from

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jamming the tape by stopping the takeup spindle.

- O. In case of a tape jam or breakage, the unit will shut down.
- P. The unit will operate only with a cassette in its proper position.
- Q. A cassette cannot be installed backwards.
- R. The amplifier is muted during review and side changing to eliminate unwanted sounds.
- S. Triple interlock cassette removal sequence helps prevent inadvertent cassette removal until the end of the last track.
(See Section 6.3)

2. APPLICABLE DOCUMENTS

The following documents and publications, of the issue in effect on the date of invitation for bids, form a part of this specification. In the event of conflict between the documents and publications referenced herein and the content of this specification, the content of this specification shall be considered a superseding requirement.

Specifications:

National Library Service for the Blind and Physically Handicapped

#202 - Cassette Book Duplication

Standards:

MIL-STD 105 - Sampling Procedures and Tables for Inspection by Attributes

(Copies of MIL-STD 105 may be obtained from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402)

International Tape Association (ITA)
ITA Standard Interface Cassette Hardware/Software
ITA Standard - Audio Cassette Specification

(Copies of ITA Standards may be obtained by writing International Tape Association, 10 West 66th Street, New York, New York 10023)

International Electrotechnical Commission (IEC) Recommendations:
IEC 94 Amendment #1, #2, #3 and #4
Magnetic Tape Recording and Reproducing Systems
Dimensions and Characteristics

IEC 94A - supplement to Publication 94, Amendment #1 and #2
Cassette for Commercial Tape Records and Domestic Use, Dimensions and Characteristics

(Copies of IEC Standards may be obtained from the American National Standards Institute, 1430 Broadway, New York, New York 10018)

Electronic Industries Association (EIA) Standard:
RS-399A - Dimensional Standard Coplanar Magnetic Tape Cartridge Type CP II.

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Bulletin: Consumer Products Engineering Bulletin #7
(November 1974) Audio Rectification.

Federal Communications Commission:
EMI-FCC Rule Part 15J for Class B Devices

(Copies of FCC Rules may be obtained from the Federal Communications Commission, 1919 M Street, N.W., Washington, DC 20036.)

Underwriters Laboratories Standards:
1097 Double Insulation
1270 Radio Receivers Audio Systems & Accessories
94V-0 Flammability Requirements

(Copies of U.L. Standards may be obtained from Underwriters Laboratories, 333 Pfingsten Road, Northbrook, IL 60062.)

3. REQUIREMENTS

3.1 Prototype Model

Bidders are required to submit one complete prototype machine with their bid package. The prototype can be constructed from a production machine obtained from NLS. Records of test results and certification of compliance with the requirements or deviations therefrom under this specification shall accompany this prototype.

3.2 Preproduction and Production Approval Samples

After contract award, one complete preproduction machine shall be provided by the contractor to NLS as scheduled under Special Conditions of the contract. From this machine, print texts of descriptions of operations and functions will be provided to NLS. Such instructions will be produced by the manufacturer in braille, large print, and recorded format and packaged with each production machine. Operation and functions must agree with the tests: any changes in function are the manufacturer's responsibility to incorporate in the instructions with NLS approval. A minimum of six (6) weeks is required for the production of instruction texts by NLS (see para. 5.3.2).

3.3 General Design Features

3.3.1 Size

Size - The overall external dimensions shall not exceed the following values:

Length: 10 inches (25.4 cm.)
Width: 7.5 inches (19.05 cm.)
Height: 3.125 inches (7.94 cm.)

3.3.2 Weight

Weight shall not exceed 5.5 pounds.

3.3.3 Controls

All user operable controls shall be accessible from the top of the case. Control operation shall be from side to side. Volume, and the auto/manual switch shall be slide type controls. Review and side advance shall be push buttons. A removable cover shall be installed over the auto/manual switch and side advance controls. Controls shall be easily located and identified.

3.3.4 Push Buttons

Push buttons shall be identified by raised markings.

3.3.5 Cassette Loading Elevator

The cassette loading area shall be enclosed and provide for retention and release of the cassette. Loading and unloading of the cassette shall be easily accomplished by a handicapped user.

The following two steps are required for cassette loading:

1. Cassette Insertion: Locate cassette on lifter carriage, braille side up and push all the way down. Releasing, locks the carriage down and the cassette elevator closes the cassette sense switch.
2. Closing the door inserts the head into the cassette, engages the pressure rollers and closes the door sense switch.

3.3.6 Jack Bank

All jacks shall be flush mounted with the case. Raised markings shall indicate each jack function.

3.4 Case Design

3.4.1 Material

The case material shall be flame retardant and molded from ABS polymer or high-impact polystyrene and shall be rated UL approved 94V-0 flammability requirement.

3.4.2 Stability

Case stability shall be such that the unit cannot be tipped when lying on the two longest dimensions.

3.4.3 Rubber Feet

Rubber feet or equivalent shall be provided to prevent machine skidding.

3.4.4 Handle

The handle shall be self-storing and shall be permanently attached to the case.

3.4.5 Protuberances

There shall be a minimum protuberance of latching devices, hinges, and other appurtenances.

3.4.6 Power Cord

A heavy-duty eight (8) foot power cord shall be used. The cord shall be SVT Double Insulation. The cord will have a molded on anti-rotation strain relief that includes a bend relief.

3.4.7 Appearance

All corners and edges shall be rounded. The case shall be free of burrs, rough spots, and sharp edges.

3.5 Isolation Transformer

The machine shall incorporate a built-in line isolation transformer. Double insulation shall be provided.

3.5.1 Power Supply Performance

AC supply operating range: 100 to 130 volts, 50/60 Hz.

AC supply performance range: 120 ± 10 volts, 50/60 Hz.

Power consumption:

9 ± 3 Watts using blank tape.

4 ± 2 Watts stopped. (Volume in off position)

An electronic sensing circuit shall be provided to reset the microprocessor after low power line voltage drops occurring below the operating range of 100 to 130 volts AC, 50/60 Hz.

3.5.2 U.L. Approval

U.L. approval is required according to U.L. Standard 1097 - Double Insulation and applicable requirements of U.L. Standard 1270.

3.6 Tape Head

3.6.1 Number of Tracks

The playback head shall be capable of 4-track monaural reproduction.

3.6.2 Track Switching

Provisions shall be made for automatic or manual switching between tracks, and for a non-volatile memory for track retention.

3.6.3 Track Location

The location of all tracks in the head shall conform to IEC Specification #94A.

3.6.4 Crosstalk

Interchannel crosstalk shall be -40 dB or better at 0.5 kHz.

3.7 Speaker

3.7.1 Impedance

The speaker shall be rated at 4 ohms impedance.

3.7.2 Acoustic Output

The amplifier/speaker/enclosure system shall be capable of producing 80 ± 8 dB sound pressure level (SPL) (Reference 2×10^{-5} N/m²) when operated over a passband of 500 to 4000 Hz. At 250 Hz, 20 dB down is acceptable (reference 80 dB at 1000 Hz).

3.8 Jack Bank

3.8.1 Functions

Two jacks are required in the jack bank. Jack function is as follows:

- a. Earphone
- b. Headphone

The earphone jack shall be a 1/8-inch mini-jack. The headphone jack shall be a 1/4-inch standard monaural phone. The earphone and headphone jack connections shall be paralleled.

3.8.2 Protection

The amplifier shall be protected from open or short circuit conditions when plugs are inserted into the jacks.

3.8.3 Earphone and Headphone Output

An output of 20 mW minimum to 60 mW maximum (3.0% THD maximum into 8 ohms) without clipping, shall be available at both the earphone and headphone jacks.

3.9 Motors

3.9.1 Voltage

Three DC motors, operated from a nominal 12.0 volts are required.

3.9.2 Play Speed Tolerance

Play speed tolerance shall not exceed $\pm 2.0\%$ measured at 15/16 ips.

3.9.3 Wow and Flutter

The rms NAB weighted flutter over the whole length of the tape, in both directions of tape motion shall not exceed 0.9% rms (without any external filter), and 0.65% rms using an external high pass filter with cut off frequency set at 5.0 Hz. (Using test tape IS 1086, filter attenuation rate 48 dB per octave).

3.10 Tape Deck

3.10.1 Control Orientation

All reference to positions "normal, horizontal, vertical, up, down, left, right, etc." shall be from the operation viewpoint, with the

cassette in the machine in such a position that the relevant label area is in a horizontal plane facing upward, and the tape head recess is facing away from the operator.

3.10.2 Cassette Acceptance

The machine shall satisfactorily accept the cassette as described in existing International Documents International Tape Association (ITA) Standard for Audio Cassette. The machine must be able to

reproduce the recorded content of a cassette within Figure 1 IEC Document 94A.

3.10.3 Cassette Position and Support

The machine shall be so designed that the cassette is positioned and supported while operating at support planes, prime reference line and reference hole, so defined in IEC Document 94A.

3.10.4 Tape Head Insertion

The tape head insertion shall be in accordance with the data given in the dimensional ITA Standard for (C-60) cassette in accordance with IEC Document 94A (see section 2.0 of this specification) with referenced addendum.

3.10.5 Head Azimuth Position

Deviation of the azimuth position of the head gap shall not exceed +7 to -3 dB from maximum output.

3.10.6 Head Perpendicularity

The surface of the head or heads in contact with the tape shall be within 2 degrees perpendicular to the cassette support plane and within 2 degrees of each other.

3.10.7 Spindle Perpendicularity

The spindle axis shall be perpendicular to the referenced support plane within 2 degrees.

3.10.8 Guide, Capstans, and Pressure Roller Perpendicularity

The guides, capstans, and pressure roller shall be perpendicular to the support plane within 1 degree. Dual capstan drive is required.

3.10.9 Other Member Perpendicularity

Any other member inserted into any part of the tape path shall be within 2 degrees perpendicular to the cassette support plane.

3.10.10 Radial Withdrawal Force

The machine shall not exert forces that result in over 0.5 Newtons (about 500 grams) radial withdrawal force of the tape or leader from the hub attachment at the end of the tape.

3.10.11 Drive Train Layout

Drive train layout shall be according to the limits and dimensions as indicated in Figure A of IEC Document 94A. This figure indicates the required position of the left and right-hand spindles and their relationship to the capstans and prime reference line of the cassette.

3.10.12 Torque Values

- a. Running torque: 35 to 60 gram centimeters.
- b. Rewind mode 55 gram centimeters (minimum).
- c. Hold back torque: 4 to 20 gram centimeters.

3.10.13 Cassette Carriage Unlatch Force

The vertical force applied to the center of the braille label to unlatch the cassette carriage with the instruction cassette installed shall not exceed 5 pounds (2.27 kg).

3.11 Amplifier

3.11.1 Amplifier Performance

3.11.1.1 Rated Output Power

The amplifier shall be capable of 1.5 watts minimum output into a 4 ohm load. (See para. 4.6.7.4.1) The lowest volume control setting that allows machine operation shall produce less than 0.65 mW (0.051 Volts).

3.11.1.2 Harmonic Distortion

Total harmonic distortion of the amplifier shall not exceed 3% at 1.0 watt into 4 ohm load.

3.11.1.3 Frequency Response

The equalized amplifier frequency response shall be flat within +7 and -3 dB from 0.250 kHz to 5.0 kHz at 15/16 ips.

3.11.1.4 Signal to Noise Ratio

The "A" weighted signal-to-noise ratio shall be 45 dB minimum.

3.11.1.5 Discontinuity

Acceptable amplifiers shall not exhibit discontinuity in a sine wave at the point of zero axis (x coordinate) crossing. One thousand (1000) Hertz shall be employed as input to the amplifier. The input signal shall be set to a level sufficient to produce approximately half the maximum undistorted amplifier output into a resistive load.

Amplifiers showing cross-over distortion on an oscilloscope shall be rejected.

3.11.2 Construction

3.11.2.1 Printed Circuit Board

All printed circuit boards shall be constructed of NEMA Grade CEM-1, CEM-3 or FR-4 materials and shall be rated UL approved 94 V-0.

3.11.2.2 Modularity

A modular plug-in design is required.

3.11.2.3 Design Review

Design review and approval of all printed circuit boards by the NLS Engineering Change Control Board is required.

3.11.2.4 Accessibility

Placement of the board in the case shall be such that it is easily accessible for repair or replacement.

3.12 Programmable Read Only Memory (PROM)

The microprocessor used in this design is manufactured by Intel #8048, Telex #53308001. The program is according to NLS drawing #59540-000. The machine shall comply with FCC Rule Part 15J for Class B Devices Electromagnetic Interference (EMI).

3.13 Silence Sense and Mechanical End of Tape (MEOT)

3.13.1 Silence Sense

Silence sense shall be activated by the lack of recorded signals on the tape that exceed a level of -23 dB nominal from standard record level (SRL). Silence sense shall function 9 to 15 seconds after the signal ends on both the track being played and the next track to be played. Signal end shall be detected when tape signals are more than -23 dB nominal from SRL. Use Tape V, IS 1087 for this test.

- a. Automatic Mode: Will switch to next track after silence sense functions.
- b. Manual Mode: Will stop machine and activate the end of side after silence sense functions.
- c. End of Last Side: Will stop machine and activate the end of last side after silence sense functions if playing track 4 or no signal (level same as signal end) is found on the next track to be played.

3.13.2 Mechanical End of Tape

When the take-up and/or the payout spindle fails to rotate for 0.5

seconds (+1,-0) seconds and a signal has been detected on the track playing, the machine shall function in the same manner as the silence sense, see a., b., or c. above. If a signal has not been detected, the machine will consider the tape is jammed and stop. The end of side tone shall be activated, followed by the end of last side tone to inform the user to remove the tape. The rewind at the end of last side shall be activated when the volume control is moved to the stop position. Test Tape VII, IS 1088, is to be used for this test.

3.14 Machine Acoustical Noise

Mechanically generated "A" weighted noise emanating from the machine shall not exceed 2 dB above anechoic chamber ambient background reference level.

3.15 Maintenance and Technical Data

The contractor shall supply 3000 copies of a technical manual for the machine. The manual shall include a description of circuit operation, signal path flow, component values, and x-ray views. The technical manual shall be similar in scope to those previously provided by NLS for all equipment. A sample of the manual shall be provided by the manufacturer for NLS approval, prior to publication. The manual shall indicate all changes made during production and shall indicate the serial numbers affected.

3.16 Short-Term Operation

The machine shall be tested for proper operation in play mode using test procedures of paragraph 4.6.9.1. All controls must function normally within the requirements of Section 3 of this specification.

3.17 Operational Life Test

The contractor shall perform the life test specified in 4.6.9.2 to demonstrate that the mean time between failures (MTBF) of the cassette book machine is at least 1000 hours

3.18 Workmanship and General Examination

The cassette-book machine shall be manufactured and processed in a careful and workmanlike manner in accordance with good assembly practice.

3.19 Warranty Provisions

Manufacturer shall unconditionally warrant the cassette book machine for a minimum of two (2) years from the date the last machine produced under the contract is shipped. The unconditional warranty covers not only defects, but also normal wear. It covers everything except customer abuse and parts missing from returned machines. Further note that NLS is the final authority on what constitutes customer abuse and must approve the manufacturer's recommendation. Unless approved by NLS, every machine returned for repair shall be

restored to meet NLS Specification #102 and packaged as a new machine for issuing to a patron. In addition, the manufacturer is responsible for performing acceptance inspections for all out-going lots of warranty machines. Warranty reports are to be forwarded to NLS Quality Assurance Section on a weekly basis. These reports are to cover every machine returned and list: serial number, agency received from, problem reported, problem diagnosed, repairs performed, and corrective actions taken in the production process to reduce future occurrences.

3.20 Subjective Listening Test

A subjective listening panel, according to paragraph 4.6.10.3, shall be convened by NLS.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The supplier is responsible for the performance of all inspection requirements specified herein. The supplier may utilize his own facilities or any reputable commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to assure that supplies and services conform to the prescribed requirements. A chart reflecting the organization of the Quality Assurance, Production, and Engineering Sections; the departmental reporting links; names and qualifications of key personnel in the various departments; and the chain of authority relating to the contractor's product inspection system is required at the time of bid. All test equipment used must have a recent calibration traceable to the National Institute of Standards and Technology.

4.2 Classification of Inspections

The inspections herein specified are classified as follows:

- a. Qualification Inspections 4.3.1
- b. Incoming Materials Inspections 4.3.2
- c. Quality Conformance Inspections 4.3.3
- d. Acceptance Inspections 4.3.4

4.2.1 Qualifications Inspections (4.3.1 and Table I)

Requires testing of a fully assembled machine for every specified parameter. Applies to prototypes, production control samples and every fifteen thousandth machine produced.

4.2.2 Incoming Materials Inspections (4.3.2 and Table II)

Indicates those parameters which may be measured as sub-assemblies during the production process and therefore need not be measured in the final assembly. Incoming materials must be sampled in

accordance with MIL-STD 105 General Inspection Level II and must meet an acceptance quality level (AQL) of 0.65 defects per 100 units.

4.2.3 Quality Conformance Inspections (4.3.3 and Table III)

Indicates tests performed during the machine final assembly process and upon the fully assembled machine prior to packing for shipment. All machines are subjected to 100% of these tests during production. There will be no relaxation of this requirement.

4.2.4 Acceptance Inspections (4.3.4 and Table IV)

Indicates sampled tests to be performed upon randomly selected machines after they have been packed for shipment. Sampling shall be in accordance with MIL-STD 105 General Inspections Level II, and must meet an acceptable quality level (AQL) of 0.65 defects per 100 units.

4.3 Definition of Inspections

4.3.1 Qualification Inspections

Qualification inspection shall consist of each of the examinations, measurements, and tests listed in Table I. All samples subjected to the examinations, measurements and tests specified in Table I must conform to the associated requirements specified in Section 3. Tested prototype samples and complete test data shall accompany the suppliers bid. Two tested production control samples and complete test data shall be submitted to NLS for approval prior to the start of production.

During production, after each fifteen thousand machines are produced, one shall be randomly sampled for a complete qualification inspection. This sample and complete production data shall be promptly submitted to NLS for verification that the design has not changed and that the production can continue.

TABLE I. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALIFICATION INSPECTIONS

Examinations, Measurements, and tests	Requirement Paragraph	Test Method Paragraph
<u>Basic Design Factors</u>		
Size	3.3.1	4.6.5
Weight	3.3.2	4.6.4
Controls	3.3.3	4.6.4
Push Buttons	3.3.4	4.6.4
Cassette Loading	3.3.5	4.6.4
Jack Bank	3.3.6	4.6.4
Case Material	3.4.1	4.6.4
Case Stability	3.4.2	4.6.4
Rubber Feet	3.4.3	4.6.4
Handle	3.4.4	4.6.4
Protuberance	3.4.5	4.6.4
Power Cord	3.4.6	4.6.4
Case Appearance	3.4.7	4.6.4
Isolation Transformer	3.5	4.6.4
Power Supply Performance	3.5.1	4.6.7.4
Number of Tracks	3.6.1	4.6.4
Track Switching	3.6.2	4.6.4
Jack Bank	3.8.1	4.6.4
Amplifier Construction	3.11.2.1	4.6.4
Modular Design	3.11.2.2	4.6.4
Amplifier Accessibility	3.11.2.4	4.6.4
Workmanship	3.18	4.6.4
<u>Operational Factors</u>		
Controls	3.3.3	4.6.9.1
Cassette Loading	3.3.5	4.6.9.1
Handle Storage	3.4.4	4.6.9.1
Track Switching	3.6.2	4.6.9.1
Short Protection	3.8.2	4.6.9.1
Subjective Listening Test	3.20	4.6.10.4
Short-Term Operation	3.16	4.6.9.1
Workmanship	3.18	4.6.9.1
<u>Performance Parameters</u>		

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Power Supply Performance	3.5.1	4.6.7.4
Crosstalk	3.6.4	4.6.7.4.8
Speaker	3.7.1 & 3.7.2	4.6.7.4.8
Earphone and Headphone Output	3.8.3	4.6.7.4.6
Speed Tolerance (Play Mode)	3.9.2	4.6.10.1
Wow and Flutter	3.9.3	4.6.10.2
Cassette Acceptance	3.10.2	4.6.5
Cassette Position and Support	3.10.3	4.6.5
Head Insertion	3.10.4	4.6.7.4.9
Head Azimuth	3.10.5	4.6.7.4.10
Perpendicularity	3.10.6, 3.10.7	4.6.5
	3.10.8, 3.10.9	4.6.5
Radial Withdrawal	3.10.10	4.6.5
Drive Train Layout	3.10.11	4.6.5
Torque Values	3.10.12	4.6.6
Cassette Carriage Unlatch Force	3.10.13	4.6.10.4

TABLE I. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALIFICATION INSPECTIONS (Cont.)

Examinations, Measurements, and tests	Requirement Paragraph	Test Method Paragraph
<u>Performance Parameters(Cont.)</u>		
Amplifier Rated Output Power	3.11.1.1	4.6.7.4.1
Discontinuity	3.11.1.1	4.6.7.4.1
Harmonic Distortion	3.11.1.2	4.6.7.4.2
Frequency Response	3.11.1.3	4.6.7.4.2
Signal-To-Noise Ratio	3.11.1.4	4.6.7.4.5
Silence Sense	3.13.1	3.13.1
Mechanical End of Tape	3.13.2	3.13.2
Machine Acoustical Noise	3.14	4.6.7.4.7
Short Term Operation	3.16	4.6.9.1
Operational Life Test	3.17	4.6.9.2
Workmanship	3.18	4.6.4

4.3.2 Incoming Materials Inspections

Incoming materials inspections shall consist of each of the examinations, measurements, and tests listed in Table II. The contractor shall select the appropriate number of samples from incoming lots or batches. All sampling for examinations, measurements, and tests shall be in accordance with MIL-STD 105, General Inspection Level II, at an acceptable quality level (AQL) of .65 defects per hundred units.

4.3.2.1 Lot

A lot shall consist of any and all parts of one type received during one shipment.

TABLE II. EXAMINATIONS, MEASUREMENTS, AND TESTS
INCOMING MATERIALS INSPECTIONS and or LINE TESTS

Examinations, Measurements, and tests	Requirement Paragraph	Test Method Paragraph
<u>Basic Design Factors</u>		
Push Buttons	3.3.4	4.6.4
Cassette Loading	3.3.5	4.6.4
Case Appearance	3.4.7	4.6.4
Workmanship	3.18	4.6.4
<u>Performance Parameters</u>		
Power Supply Performance	3.5.1	4.6.7.4
Crosstalk	3.6.4	4.6.7.4.8
Speed Tolerance (Play Mode)	3.9.2	4.6.10.1
Wow and Flutter	3.9.3	4.6.10.2
Cassette Acceptance	3.10.2	4.6.5
Cassette Position and Support	3.10.3	4.6.5
Head Insertion	3.10.4	4.6.7.4.9
Perpendicularity	3.10.6 thru 3.10.9	4.6.5
Radial Withdrawal	3.10.10	4.6.5
Amplifier Output	3.11.1.1	4.6.7.4.1
Harmonic Distortion	3.11.1.2	4.6.7.4.2
Frequency Response	3.11.1.4	4.6.7.4.3
Signal-to-Noise Ratio	3.11.1.4	4.5.7.4.5
Discontinuity	3.11.1.5	4.6.7.4.1
Programmable Read-Only Memory	3.12	4.6.5
Workmanship	3.18	4.6.4

4.3.3 Quality Conformance Inspections

Quality conformance inspections upon the assembled machine prior to packing shall consist of each of the examinations, measurements and tests listed in Table III.

All of the machines must be 100% tested for the requirements of Table III. There will be no relaxation of this requirement.

TABLE III. EXAMINATIONS, MEASUREMENTS, AND TESTS

QUALITY CONFORMANCE INSPECTIONS

Examinations, Measurements, and tests	Requirement Paragraph	Test Method Paragraph
<u>Operational Features</u>		
Controls	3.3.3	4.6.9.1
Push Buttons	3.3.4	4.6.4
Cassette Loading	3.3.5	4.6.9.1
Handle Storage	3.4.4	4.6.9.1
Track Switching	3.6.2	4.6.9.1
Jack Bank	3.8	4.6.9.1
Short Protection	3.8.2	4.6.9.1
Subjective Listening	3.20	4.6.10.4
Short-Term Operating	3.16	4.6.9.1
<u>Performance Parameters</u>		
Power Supply Performance	3.5.1	4.6.7.4
Earphone and Headphone Output	3.8.3	4.6.7.4.6
Crosstalk	3.6.4	4.6.7.4.8
Speed Tolerance (Play Mode)	3.9.2	4.6.10.1
Wow and Flutter	3.9.3	4.6.10.1
Torque Values	3.10.12	4.6.6
Amplifier Output	3.11.1.1	4.6.7.4.1
Harmonic Distortion	3.11.1.2	4.6.7.4.2
Frequency Response	3.11.1.3	4.6.7.4.3
Signal-to-Noise	3.11.1.4	4.6.7.4.5
Head Insertion	3.10.4	4.6.7.4.9
Head Azimuth	3.10.5	4.6.7.4.10
Silence Sense	3.13.1	3.13.1
Mechanical End of Tape	3.13.2	3.13.2

4.3.4 Acceptance Inspections

Acceptance inspections shall consist of each of the examinations,

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measurements, and tests listed in Table IV. The contractor shall select the appropriate number of samples from the packed, ready-to-ship machines. All samples subjected to the examinations, measurements, and tests specified in Table IV must conform to the appropriate requirements specified in Section 3. Sampling for Table IV examinations, measurements and tests shall be in accordance with MIL-STD 105, General Inspection Level II, and must meet an acceptable quality level (AQL) of .65 defects per hundred units.

4.3.4.1 Lot

A lot shall consist of any and all machines manufactured on one production line during any one given 8-hour time period.

TABLE IV. EXAMINATIONS, MEASUREMENTS, AND TESTS

ACCEPTANCE INSPECTIONS

Examinations, Measurements, and tests	Requirement Paragraph	Test Method Paragraph
Power Output	3.11.1.1	4.6.7.4.1
Frequency Response	3.11.1.3	4.6.7.4.3
Crosstalk	3.6.4	4.6.7.4.3
Wow & Flutter	3.9.3	4.6.10.2
Harmonic Distortion	3.11.1.2	4.5.7.4.2
Short-Term Operation	3.16	4.6.9.1
Silence Sense	3.13.1	3.13.1
Mechanical End of Tape	3.13.2	3.13.2
Cassette Loading	3.3.5	4.6.9.1
Controls	3.3.3	4.6.9.1
Handle Storage	3.4.4	4.6.9.1
Track Switching	3.6.2	4.6.9.1
Workmanship	3.18	4.6.9.1
Jack Bank	3.8	4.6.9.1
Labeling and Packaging	5.1 & 5.3	4.6.4
Torque Values	3.10.12	4.6.6
Cassette Carriage Unlatch Force	3.10.13	4.6.10.4
Speed Tolerance (Play Mode)	3.9.2	4.6.10.1
Subjective Listening	3.20	4.6.10.4
Workmanship	3.18	4.6.4

4.4 Reporting of Test Results

4.4.1 Reports

The contractor shall maintain a complete record of all test results for the duration of the contract. The test records shall be available to the Government at all reasonable times. The records shall include the information necessary to identify the lot, and the lot sample, the testing equipment, the inspector, and the date of the test. Lot inspection reports should be forwarded to NLS on a

weekly basis.

4.4.2 Methods Certification

The contractor is required to provide written certification showing that his methods of quality control incorporate those established by this specification, under Section 4.

4.4.3 Fault Correction

Should NLS determine that significant fault or faults be found in production units, then correction of the fault or faults in previously produced units and production inspections or controls for prevention shall be instituted with no additional charge to NLS.

4.5 Recalls and NLS Inspections

4.5.1 Recall

Machines produced for the talking-book program are subject to recall or rework, based on the criteria under the Quality Assurance Section. It shall be the prerogative of the contracting officer to institute a recall.

4.5.2 NLS Inspection

The right is reserved by the National Library Service for the Blind and Physically Handicapped, Library of Congress, to inspect any process or tests being performed. The Library representative shall have the authority, without advance notice, to select at random a sample machine or machines at any time during the course of the contract for testing to the specified requirements. These may be tested either at the contractor's facility, or the contractor will be required to express ship the machines to NLS Quality Assurance Section. The right is reserved by the National Library Service for the Blind and Physically Handicapped, Library of Congress, to reject any production lot represented by a tested sample which has been rejected.

4.5.3 Plant Visits

The right is reserved by the National Library Service for the Blind and Physically Handicapped, Library of Congress, to inspect plant facilities or manufacturing processes at any time without advance notice.

4.6 Examinations, Measurements, and Tests

-- Power Supply Conditions

All electrical and mechanical measurements and tests must be fully satisfied under the following AC supply conditions:

Performance range of 120 \pm 10 volts; and be operational over the AC

line voltage range of 100 to 130 volts, 50/60 Hz.

4.6.1 Order of Qualification Inspection

- a. The machine under test shall be subjected to the examinations, measurements, and tests listed in Table I. All electrical measurements are to be performed at the AC line performance voltage range consistent with par. 3.5.1.
- b. The machine shall be subjected to the environmental conditions of 4.6.8. The machine shall then be subjected to the measurement of 4.6.6 for conformance to the frictional torque requirement of 3.10.12. The machine shall then be subjected to the measurements listed in Table I.
- c. The machine shall then be subjected to the operational life test of 4.6.9.2. Measurement for conformance to the frictional torque requirement shall be for the requirement of 3.10.12.
- d. The machine shall then be subjected to the examinations, measurements, and tests listed in Table I.

4.6.2 Preliminary Conditioning

Test units shall be subjected to the test environment of 4.6.3 for a period of not less than 24 hours prior to the performance of any measurement or test specified herein.

4.6.3 Test Environment

Except as otherwise specified herein, all measurements and tests shall be performed at an ambient temperature of 21 degrees C \pm 2.8 degrees C (70 degrees F \pm 5 degrees F) and a relative humidity of between 45 and 55 percent.

4.6.4 General Examinations

Test units shall be visually and/or aurally examined for proper operation and conformance to the applicable requirements in Tables I, II, III and IV.

4.6.5 Machine Dimensions Measurements

The following listed critical dimensions shall be measured for conformance to the measurements given in EIA RS-399A. Appropriate "GO" "NO-GO" gauges may be used to determine conformance to dimensional requirements and PROM integrity.

Dimensions to be measured:

- (a) Length
- (b) Width
- (c) Height
- (d) Capstan: size and location See para. 3.10.11 (Reference EIA RS-399A)
- (e) Locating Pins: size and location (Reference EIA RS-399A, para. 3.10.11)

- (f) Reproduce Head
- (g) Hub spindles: size and location (Reference EIA RS-399A, para. 3.10.11)
- (h) Support plane flatness
- (i) Spindle, capstan, and pinch roller: perpendicularity

4.6.6 Torque Measurements

Using a torque tester (Tape VI Torque Cartridge SRK-CT) or an approved cassette type torque indicator, measure the torque at the take up spindle for conformance with the requirement in paragraph 3.10.12 a and b. Measure the torque at the supply spindle for conformance with the requirement in paragraph 3.10.12c. Reverse tape direction and repeat test. Use Test Mode I. (para. 4.7.2)

4.6.7 Reference Tape

4.6.7.1 Definition

The standard tape upon which all test tapes and levels are based.

4.6.7.2 Reference Tape and Cassette

The reference tape shall consist of a BASF DIN Calibration TAPE 4.76/3.81 (Fe) (PES 12/c 521V) produced in accordance with DIN 45 513, Sheet 6, in a cassette housing that conforms to IEC 94A (see 6.1). Equalization 120+3180 microseconds. All other test tapes utilized in this specification are traceable to this reference tape.

4.6.7.3 Reference Level

The reference level is the output level obtained from cassette part # I.S. 1108 (See para. 6.2) played at 15/16 ips.

4.6.7.4 Test Procedures

-- Power Supply Conditions

All electrical and mechanical measurements and tests must be performed under the following power supply conditions (using an AC line voltage range of 120 ± 10 volts, 50/60 Hz).

AC Power Consumption:

Equipment required:

1. AC power meter Magtrol Model #4612 PF or equivalent.

2. Variac Technipower Model #W5M or equivalent.

Procedure:

Set Variac for 130 volts AC, measure AC power consumption with machine volume control set to stop position and play position respectively, for conformance with para. 3.5.1. Record results. Repeat, with Variac set for 100 volts. Record results.

Microprocessor reset:

Set machine to play mode with loaded cassette. Select Side 2. Cycle Variac 3 times between 110 volts and 60 volts AC. Machine must resume playing side 2 when AC voltage is restored to the performance range of paragraph 3.5.1.

The following cassette machine performance measurements are applicable to all tracks.

4.6.7.4.1 Amplifier Rated Output Power and Discontinuity

Using signal source (Tape VIII, IS 1108), General Radio Power Meter 1840-A or equivalent, shall be connected across a 4 ohm termination with the speaker disconnected. The power output of the amplifier at volume control setting for 1.5 watts and 0.65 mW shall be recorded and must conform to the requirement in 3.11.1.1. An oscilloscope trace shall not exhibit crossover distortion.

4.6.7.4.2 Amplifier Output and Harmonic Distortion Equipment & Procedures

Equipment:

- (1) General Radio Power Meter 1840-A or equivalent
- (2) Test Tape - 1 kHz recorded at 15/16 ips (part #I.S. 1108) 104 nanoWebers per meter (see Section 6.2 for test tape). (Test tape shall be 8 dB below DIN Calibration Tape using reference level section.)
- (3) Flux Loop (see Section 6.2)
- (4) Distortion meter
- (5) Audio signal generator

Procedure:

- (1) Connect power meter across speaker terminals (disconnect speaker) and set for a four (4) ohm load.
- (2) Insert the test tape and start machine.

- (3) Adjust volume control to provide power reading of 1.0 Watt (minimum).
- (4) Place machine in Test Mode 2. (para. 4.7)
- (5) Connect leads from the flux loop to an audio signal generator and insert loop securely in front of the playback head. Adjust the generator for a 1 kHz signal and raise its output to duplicate the power reading in Step #3.
- (6) Connect distortion meter in parallel with power meter and record THD measurement for conformance with requirement 3.11.1.2.

4.6.7.4.3 Frequency Response

Signal source (Tape I, IS 1083 or Tape X, IS 1125) shall be used. Playback equalization of the machine shall be adjusted to conform to the requirements in paragraph 3.11.1.1. A four (4) ohm resistive load shall be substituted at the speaker. Set volume control for 200 mVrms at 333 Hz. Frequency response shall be recorded, readings shall conform to the requirements in 3.11.1.3.

4.6.7.4.4. Sound Pressure Level

An anechoic chamber shall be used for the following system measurement: Separation between the CBM speaker and the microphone shall be 1.0 meter. The microphone shall be set at 1.0 meter and oriented for perpendicular incidence. Signal source (Tape I, IS 1083) shall be set to a level referenced to 80 dB SPL at 1000 Hz without clipping. With this reference, the system shall be capable of producing 80 dB SPL at the test frequencies listed below:

0.500 kHz 1.0 kHz 2.0 kHz 4.0 kHz

Variations between test frequencies shall not exceed ± 8 dB. At 0.250 kHz the SPL output shall not be more than 20 dB down reference SPL at 1.0 kHz. The system shall not exhibit a clipped waveform at any test frequency. When plotting octave band SPL graphs, accepted point to point practice shall be followed for conformance to the requirement in para. 3.7.2.

4.6.7.4.5. Signal-to-Noise Ratio

Using signal source (Tape II, IS 1084) 333 Hz unweighted, adjust the volume control for maximum rated amplifier power (1.5 watts). Switch on the "A" weighting filter then record the voltage reading across a resistive load substituted for the speaker. Refer to this voltage as V_o . Record the output voltage reading from a blank portion of the tape. Refer to this voltage as V_n . Calculate signal-to-noise ratio from the formula:

$$S/N = (20 \log_{10} V_0/V_n) \text{ dB}$$

for conformance with the requirement under paragraph 3.11.1.4.

4.6.7.4.6. Earphone and Headphone Output

Power output from the earphone and headphone jacks shall be measured using a GR 1840-A power level meter set at 8 ohms termination. Power output shall conform to the requirement of paragraph 3.8.3. THD shall not exceed 3.0 percent from 20 to 60 mW. (Use part # IS 1108 as signal source.)

4.6.7.4.7. Machine Acoustic Noise

Using signal source (Tape II, IS 1084), place machine in play mode. Volume control shall be set to minimum. The unit under test shall be checked in four position quadrants maintaining 1.0 meters between the case outer surface and the microphone. An octave band analysis shall be conducted. Mechanically generated noise emanating from the CBM unit under test shall not exceed the background reference level of the anechoic chamber by more than 2 dB, to conform to the requirement in 3.14. NLS anechoic chamber background level is 18 ± 1.0 dB SPL ("A" weighted, reference $2 \times 10^{-5} \text{ N/m}^2$).

4.6.7.4.8 Interchannel Crosstalk

Using crosstalk test tape (Tape III, IS 1110 or Tape XI, IS 1131), disconnect speaker, and terminate with a four (4) ohm resistive load. Set band pass filter (GR 1952 or equivalent) to 500 Hz. Set reference level at 500 Hz, 2.0 volts. Denote this voltage as V_0 . Change to blank track. Denote voltage reading at blank tape section as V_1 . Calculate the crosstalk from the formula:

$$\text{Crosstalk dB} = 20 \log_{10} V_1/V_0$$

Interchannel crosstalk between all tracks shall conform to the requirements in paragraph 3.6.4.

4.6.7.4.9 Head Insertion

Using an appropriate gauge, determine the amount of head insertion and note "GO/NO-GO" acceptance for conformance to the requirement in paragraph 3.10.4.

4.6.7.4.10 Head Azimuth

Using Tape X, IS 1125 as signal source, adjust azimuth to +7 to -3 dB at 5 kHz vs. 333 Hz for each track. Check the 5 kHz response vs. the 333 Hz response from the recorded tones at -15 dB from SRL into a 4 ohm resistor load for conformance with para. 3.10.5. The production head azimuth will be mechanical by aligning

all the tape guides with an alignment fixture.

4.6.8 Environmental Test

The CBM shall be able to provide satisfactory operation after being subjected to the following humidity test: The CBM shall be placed in an environment which has a minimum 90 percent relative humidity at 40 degrees C and cycled as follows:

Sixteen (16) hours in the high humidity chamber, 8 hours at 4.5 degrees C and 90 percent relative humidity. Cycle three times. fifteen minutes after the obvious moisture has been wiped away, the unit will be tested for proper operation.

4.6.9 Operational Tests

4.6.9.1 Short-Term Operational Test

Insert a short tape length, four track, recorded cassette into the machine. Place the machine in play mode. Check the following controls for proper operation: (para. 6.4)

1. Volume control - Check for normal operation and intelligible undistorted sound.
2. Handle storage - Determine ease of operation.
3. Track switching - Check switching from track to track and auto reverse for normal operation.
4. Automatic shutoff - Confirm automatic shutoff four times. (See #3 above)
5. Short protection - Insert shorted test plugs in earphone and headphone jacks. Check for output after removal, observe no change in output level.
6. Cassette loading - Confirm ease of loading with insertion/removal four times.
7. Workmanship - Visually inspect for burrs, dirt, cracks and general appearance.

4.6.9.2 Operational Life Test

4.6.9.2.1 Life Test Procedure

Twenty (20) machines shall be operated as specified until 12 failures have occurred or until the machines have been operated for 1000 hours. NLS book cassettes or other C-90 cassettes with signal on all four sides shall be played with the volume control set between 1/2 and 3/4 of full volume, and the manual/automatic switch set to automatic mode. Verify that the silence detection circuit works properly prior to start of test. An 8 ohm load resistor may be attached to the headphone jack.

4.6.9.2.2 Failures

A failure is defined as any condition which would render a machine useless to a patron, including no tape movement in play or rewind, obvious flutter or noises, low or intermittent output, or other major malfunction. The serial number, elapsed time to failure, cause of failure, and details of repairs and parts replaced shall be recorded for each failure. Failed machines shall be restored to like new condition and returned to test. The tape path may be cleaned if necessary to continue operation; cleaning shall be recorded but will not be considered a failure.

4.6.9.2.3 Periodic Testing

Each machine shall have its tape path cleaned, and shall be tested and data recorded every 100 hours of operation for the following:

1. Torque (Play, and rewind)
2. Speed
3. Flutter in both directions of play
4. Power output
5. Crosstalk
6. Frequency response

(These tests are for information only. A machine which does not meet the specification for these tests is not considered a failure unless the failure criteria of 4.6.9.2.2 are met.)

The time between inspections shall be apportioned as follows:

96 hours in play mode,
4 hours in rewind mode

4.6.9.2.4 Data

The data shall be forwarded to NLS as it is collected. Information on failures shall be forwarded to NLS as they occur. The Weibull distribution or other appropriate distribution shall be used to project the 1000 MTBF.

4.6.10 Other Tests

4.6.10.1 Play Speed

Using signal source test cassette (Tape IV, IS 1086) measure frequency of signal at both ends of the tape and in both playback directions. The measured frequency shall be noted and the percentage of fast or slow speed calculated. The calculation shall conform to the requirement in 3.9.2.

4.6.10.2 Wow and Flutter

Test equipment Bruel & Kjaer flutter meter, model 6203 or equivalent, Krohn-Hite filter, model 3343 or equivalent.

Using signal source (Tape IV, IS 1086) measure NAB weighted rms flutter at both ends of the tape and in both playback directions, for conformance to the requirement of 3.9.3. (Reference NAB standard for magnetic recording and reproducing, April 1965, Section 2.13.01 and 2.13.02 for weighted measurement.)

Note: The following flutter measurement is to be done for qualification inspection only (para 4.3.1). Connect external filter to flutter meter, set filter for 5.0 Hz high pass, measure NAB weighted flutter. Reading must conform to 3.9.3.

4.6.10.3 Subjective Listening Test

A subjective listening test shall be performed by a panel convened for judging acceptability of sound quality, consistent with the requirements in paragraph 3.20. Approval of the sound quality by the listening panel is required prior to production approval.

4.6.10.4 Cassette Carriage Unlatch Force

Using an appropriate force gage (Ametek, model Accu-Force II or equivalent), measure vertical force applied near center of the braille label of the instruction cassette, for carriage unlatch. Verify measurement for conformance to paragraph 3.10.13.

4.7 Test Routines

4.7.1 Select Test Mode

Initial Conditions: playing, end of side or end of last side. Press and hold side identification/advance switch until continuous "C" tone is heard. While still holding the side switch in, switch the Auto/Manual switch back and forth until a continuous "E" tone is heard. Release the side switch and then push the side switch the number of times that corresponds to the test routine number desired. Upon each activation of the switch the E-1 will acknowledge with a "B" tone.

4.7.2 Test 1 - Extend MEOT Timeout Duration

The E-1 will perform in its normal manner except that the MEOT delay times for play and review will be 5 seconds instead of the normal 0.5 seconds.

4.7.3 Test 2 - Capstan Motor Only Test

Insert the flux loop cartridge prior to entering this test mode.

Note: opening the door or trying to run this test with a normal cassette will cause the unit to abort the test. The E-1 will perform normally except that the spindle motors will not operate.

4.7.4 Test 3 - End of Last Side Rollover

In this mode the E-1 will perform normally except when end of last side is reached. At the end of the last side, the unit will announce end of last side, side one and the test mode, then resume playing on side one.

Test modes 1, 2, 3 - The test selected will be announced by the same number of "E" tones as the test number, sounded after the side is announced. The test will be announced after either a side identification or a side advance.

4.7.5 Test 4 - Spindle Motors and MEOT Test

Insert an empty cassette shell, such as a flux loop cassette, prior to selecting this test. After the test has been selected the E-1 will announce the same number of "E" tones as the test number. The spindle motors will turn on for one second and then stop. An "A" tone will signal successful completion of the test. If either spindle fails to rotate or if one of the photo-detectors is defective, an "E" tone will be sounded prior to the "A" tone. Upon completion of the test the E-1 will return to normal mode.

4.7.6 Exiting Test Mode

1. Unplugging the E-1 will reset to normal mode.
2. Selecting the test mode and not selecting a test will reset to normal mode.
3. Upon completion of test 4 above, the E-1 will return to normal mode.

5. PREPARATION FOR DELIVERY

5.1 Machine Labeling

5.1.1 Property U.S. Government

Each individual CBM shall be marked with permanent legible lettering, stating the following:

National Library Service for the Blind and Physically Handicapped,
Property of the U.S. Government.

5.1.2 Serial Number/Machine

Each individual CBM shall be serialized externally and internally with a permanently attached serial number label.

5.1.3 Serial Number/Carton

Matching serialization shall be included on the outside of each individual CBM shipping carton. Overpacks shall include serial numbers as reflected in the NLS mailing label area.

5.1.4 Model Designation

Each CBM shall be externally marked with the model designation (e.g., E-1).

5.1.5 Warning

The bottom of the machine case shall bear the following information or appropriate, U.L. approved language, in the order given:

WARNING: To prevent fire or shock hazard, do not expose this appliance to rain or moisture.

CAUTION: To prevent electric shock, do not remove cover. No user serviceable parts inside. Refer servicing to qualified service personnel.

Manufactured by _____ (city) _____ (state)
for the National Library Service for the Blind and Physically Handicapped, Library of Congress.

5.1.6 Control Settings

Volume control set to off.

5.2 Drop and Vibration Testing

The contractor is required to package the machine in such a manner that the following drop and vibration tests will not cause machine damage.

5.2.1 Drop Testing

The National Safe Transit Association, Pre-Shipment Test Procedure, Project 1A, is the minimum acceptable test for qualifying a CBM. A 30-inch drop test is acceptable as noted under performance limits for packaged products less than 21 pounds. Drop shall be on all sides and one corner. No damage to the machine shall result.

5.2.2 Vibration Testing

The packaged machine must withstand vibration test specified by the National Safe Transit Association, Pre-Shipment Test Procedure, project 1A, for packaged products weighing under 100 lbs. The unit will be tested for proper operation after the test as per paragraph 4.6.9.1. A report of the verification of the drop and vibration tests must be submitted to NLS within two weeks after the start of production but prior to shipment.

5.3 Packing for Shipment

5.3.1 Container

The CBM shall be packed for shipment, four to an overpack, each CBM packed in an egg crate, foam lined clam shell carton, the carton and

the overpack having or exceeding the durability for RSC 275 board. Dimensions shall be determined by the contractor. A minimum requirement for sealing and shipping the overpack shall be that specified by the "two ship" method approved under UFC rule #41 prescribed by the Interstate Commerce Commission, except that no staples shall be used on the opening end of the container. Each individual carton and the overpack shall be marked on the outside. Lettering must be approved by the NLS.

5.3.2 Instruction

The contractor shall print and include an instruction sheet in large print with each machine. The contractor will provide a 4-track instruction cassette which will be packaged in each machine. Text of the instruction cassette and the large print instruction sheet will be GFE. A braille instruction sheet shall be provided by the contractor. Text shall be supplied by NLS.

5.3.3 Container Labeling

The opening end of the carton shall be marked as follows:

"Open this end"

The top of the container shall read:

**PROPERTY OF U.S. GOVERNMENT
NATIONAL LIBRARY SERVICE FOR THE
BLIND AND PHYSICALLY HANDICAPPED
LIBRARY OF CONGRESS
WASHINGTON, DC 20542**

Arrows on the top shall indicate the normal opening position. Placement of the machine inside the container shall agree with the direction of the arrows so that when the container is opened, the machine will be found with the cabinet handle easily accessible, and in its normal operating position. The back end of the container shall be marked **"Open other end"**. The bottom side of the carton shall read: **SAVE THIS CARTON TO RETURN CONTENTS**. The two sides are to be marked:

Model No. E-1

Serial No. _____

5.3.4 Manifold Inventory Cards

The manufacturer shall furnish and include the manifold inventory cards. These cards shall consist of 90 pound card stock, color to be determined by the NLS, 3 by 5 inch postcards attached to each other by perforation (Sample attached). The manufacturer shall preprint the model and serial number on the blank line designated. The manifold cards shall be placed in a packing envelope with a clip and eyelet flap and attached to the outside of each machine box. The serial numbers of the machines noted on the manifold cards shall correspond to those of the specific machines.

6. NOTES

NLS
Specification #102

All tapes listed in 6.2 and used as signal sources in Section 4 shall be referenced to paragraph 6.1.

6.1 Reference Cassette

The BASF Din 45513/6, IEC 94 Calibration Tape (Part # 54407, Equalization 120+3180 Microseconds) may be obtained from:

Order Department
BASF Systems
Crosby Drive
Bedford, Massachusetts 01730

6.2 Test Tapes

- I. IS 1083 15/16 ips (2.38 cm/s) Frequency Response -Equalization 1590/120 microseconds. Reference is 333 Hz at 250 nWb/m full track recording with no high end boost. Test frequencies are recorded at -10 dB from reference. These frequencies are: 333 Hz, 250 Hz, 500 Hz, 1 kHz, 2 kHz, 3 kHz, 4 kHz and 5 kHz.
- II. IS 1084 15/16 ips (2.38 cm/s) Signal to Noise - Full track 333 Hz at 250 nWb/m for 11 seconds followed by 10 seconds of blank tape (without bias) for the entire length of tape.
- III. IS 1110 Crosstalk - 1-7/8 ips (4.76 cm/s) - 1 kHz recorded at reference level on Tracks 1 and 3. Tracks 2 and 4 are blank. (At 15/16 ips (2.38 cm/s) frequency will be : 500 Hz on Tracks 1 and 3, blank on Tracks 2 and 4).
- IV. IS 1086 Speed and Flutter at 15/16 ips (2.38 cm/s) - recorded at 6000 Hz on a low flutter 1-7/8 ips (4.76 cm/s) test tape recorded at -5 to -10 dB below SRL.
- V. IS 1087 Silence Sense at 15/16 ips (2.38 cm/s)
1 kHz recorded at -20 dB from SRL for 30 seconds
1 kHz recorded at -30 dB from SRL for 20 seconds
- VI. Twin Torque Test Cassette - (SRK-CT) Telex Part 92776-000 (57793-000)
- VII. IS 1088 MEOT Mechanical End of Tape - a cassette containing 5 seconds of blank tape or leader on each side of 18 seconds. Side identification - side 1, side 2, and side 3 for their respective sides at 0 to -12 dB from SRL level and side 4 at -28 dB or less from SRL level.
- VIII. IS 1108 15/16 ips (2.38 cm/s) 1 kHz at 5 dB below the reference level of 180 nWb/m at 333 Hz.
- IX. IS 1115 Flux Loop Cartridge.
- X. IS 1125 short response tape recorded at 15/16 ips (2.38 cm/s) - Equalization 1590/120 microseconds.
Test frequencies are recorded full track at -15 dB from SRL (250 nWb/m). The frequencies are:
333 Hz, 250 Hz, 5 kHz, and 333 Hz.

- XI. IS 1131 Crosstalk - 1 7/8 ips (4.76 cm/s) - 1 kHz recorded at reference level on tracks 1, 2, and 3 for 5 seconds followed by 1 kHz recorded at reference level on tracks 2 and 3 only for the duration of the tape.

Performance Test Tapes are available from:

Telex Communications Inc.
9600 Aldrich Avenue, South
Minneapolis, MN 55420
Order by IS number

6.3 Functional Controls

(Tones are described in Section 1 - SCOPE)

- A. Loading Cassette - the following three steps are required:
1. Volume control must be in off position.
 2. Cassette Insertion - Locate cassette on elevator, braille side up, and push all the way down. Releasing locks the carriage down and the cassette closes the cassette sense switch.
 3. Door - Closing the door inserts the cassette head and the pressure rollers into the cassette and closes the door sense switch.
- B. Auto Rewind - Cassette will rewind to beginning of side 1.
- C. Rewind Tone - When tape is rewound to the beginning the machine will turn off and a tone will sound. This tone is a single low frequency (523 Hz) tone for about 0.5 seconds.
- D. Start - Moving the volume control to the right will start the machine.
- E. Automatic Play - When the manual/automatic switch is in the automatic play position the machine will switch to the next track upon silence sense or MEOT.
- F. Manual Play - When the manual/automatic switch (NA) is in the manual play position the machine will stop at silence sense or MEOT. A single low frequency (523 Hz) tone of 0.5 seconds duration will indicate end of side.
- G. End of Last Side - When the silence sense or MEOT is activated while playing track 4 or the next track does not have a signal above -23 dB from SRL, the end of last side tone will occur. This tone is the low frequency (523 Hz) tone for a duration of 2 seconds.
- H. Rewind at End of Last Side - After the end of last side tone occurs and the volume control is moved to the stop position, the machine will fast wind to the beginning of the cassette book. When finished a single low frequency (523 Hz) tone for

about 0.5 seconds will be generated.

- I. Review - The review button may be pushed any time the machine is playing to review a portion or all of the side being played. When all the tape is rewound the MEOT will stop the review motor and activate a continuous low frequency (523 Hz) tone with a 1 Hz clock pulse interruption until the review button is released. An error tone will sound if the review button is not completely depressed.
- J. Review button activation after silence sense or MEOT has stopped the machine at the end of side in the manual mode or the end of the last side in either the automatic or manual mode will rewind the tape for a portion or all of the side that was playing.
- K. Stop - Moving the volume control to the stop position (far left) will stop the machine. An error tone will sound if the volume is not completely in the stop position.
- L. Restart - Moving the volume control to the right will start the machine at the same point on the side that was previously playing, provided cassette has not been removed.
- M. Tape Malfunction -
 - 1. Tape Breaks - MEOT will stop the unit if break occurs before a capstan because the hold back spindle will not rotate. If after the capstan, the tape will spill into the machine until the hold back spindle stops rotating.
 - 2. Tape Stoppage - MEOT will stop the unit.
- N. Side Identification (NA) - Pushing and releasing the side advance button within 2 seconds will activate a high frequency (1.3 kHz) tone for 0.6 seconds followed by 0.2 seconds quiet. The number of tones will represent the side playing, i.e., 1 tone for side 1, 2 tones for side 2, 3 tones for side 3, and 4 tones for side 4.
- O. Side Advance (NA) - Pushing and holding the side advance button for 2 seconds will stop the machine and activate a continuous low frequency (523 Hz) tone with clock pulse interruptions. releasing the advance button will now activate a timed high frequency (1.3 kHz) tone (0.6 seconds followed by 0.2 seconds quiet). The number of tones will represent the side to be played. The machine will start after the tones stop.
- P. Door Switch - Pushing the door back to its load position will stop the machine. Pulling it forward to its play position will start the machine at the same point on the side that was previously playing.
- Q. Unplugging the Line Cord - When the line cord is removed from

the AC outlet the machine will stop functioning. When the line cord is reinserted into the AC outlet the machine will start playing at the same location on the same side that was playing when the line cord was removed. If the cassette was unloaded and a new one reloaded with the line cord unplugged the machine will remain in the play mode for the side that was playing. If the machine is unplugged while it is in any other functioning mode besides play it will be in the play mode upon replugging.

- R. Unloading Cassette - The following three steps are required:
1. The volume control must be moved to the off position. If the machine was automatically stopped at the end of the last side and the low frequency (523 Hz) end of last side tone was activated, the cassette will be rewound to the beginning and a single low frequency (523 Hz) tone for about 0.5 seconds will be activated. If the machine was playing or stopped at the end of a track, the stop mode will be activated.
 2. The door must be pushed back to its load position. If this step is performed before the one above (volume control moved to the off position) the stop mode will be activated and the machine will remain in the stop mode when the volume control is moved to the off position.
 3. Pushing down on the Braille label of the cassette will release the carriage and allow the cassette and the elevator to rise (only if conditions 1 and 2 above are fulfilled).

6.4 Machine Operation

(Tones are indicated in Section 1 - SCOPE)

6.4.1 Basic Operation of the E-1

NOTE: In "Operation", (U) = User Operation, (M) = Machine Operation. Functions marked (N/A) are not accessible to the user. A fully recorded cassette is used.

6.4.1.1. Loading

A. Initial Conditions

1. Door open
2. Volume control on STOP
3. Elevator up
4. Plugged in

B. Operations

1. (U) Select Manual or Automatic Play mode. (N/A)
2. (U) Place cassette on elevator, Braille label up, open end towards back of unit.
3. (U) Depress cassette until carriage locks down.

4. (U) Close door.
5. (M) Tape is rewound to the beginning of side 1.
6. (M) End of tape.
7. (M) Rewind is stopped.
8. (M) "A" tone indicates rewind completed.

6.4.1.2 Play Modes

A. Manual Play Operations (N/A)

Most of Section 6.4.1.2 A is not accessible to the user unless side cover is removed.

1. (U) Slide volume control to right.
2. (M) Side 1 plays.
3. (M) End of side 1.
4. (M) Play is stopped.
5. (M) "A" tone indicates end of side.
 - a. (U/Optional) Press Side button momentarily.
 - b. (M) One "B" tone indicates Side 1, followed 1 second later by an "A" tone indicating end of side.
6. (U) Press Side button and hold until "C" tone is heard, then release.
7. (M) Play direction is reversed.
8. (M) Two "B" tones indicate switch to side 2.
9. (M) Side 2 plays.
10. (M) End of side 2.
11. (M) Play is stopped.
12. (M) "A" tone indicates end of side.
 - a. (U/Optional) Press Side button momentarily.
 - b. (M) Two "B" tones indicate side 2, followed 1 second later by an "A" tone indicating end of side.
13. (U) Press Side button and hold until "C" tone is heard, then release.
14. (M) Play direction is reversed.
15. (M) Three "B" tones indicate switch to side 3.
16. (M) Side 3 plays.
17. (M) End of side 3.
18. (M) Play is stopped.
19. (M) "A" tone indicates end of side.
 - a. (U/Optional) Press Side button momentarily
 - b. (M) Three "B" tones indicate side 3, followed 1 second later by an "A" tone indicating end of side.
20. (U) Press Side button and hold until "C" tone is heard, then release.
21. (M) Play direction is reversed.
22. (M) Four "B" tones indicate switch to side 4.
23. (M) Side 4 plays.
24. (M) End of side 4.
25. (M) Play is stopped.
26. (M) "D" tone indicates end of last side.

- a. (U/Optional) Press Side button momentarily
- b. (M) Three "B" tones indicate side 3, followed 1 second later by an "A" tone indicating end of side.

B. Automatic Play Operations

- 1. (U) Slide volume control to right.
 - 2. (M) Side 1 plays.
 - 3. (M) End of side 1.
 - 4. (M) Play direction is reversed.
 - 5. (M) Side 2 plays.
 - 6. (M) End of Side 2.
 - 7. (M) Play direction is reversed.
 - 8. (M) Side 3 plays.
 - 9. (M) End of side 3.
 - 10. (M) Play direction is reversed.
 - 11. (M) Side 4 plays.
 - 12. (M) End of side 4.
 - 13. (M) Play is stopped.
 - 14. (M) "D" tone indicates end of last side.
- a. (U/Optional) Press Side button momentarily.
(N/A)
 - b. (M) Four "B" tones indicate side 4, followed 1 second later by a "D" tone indicating end of last side.

6.4.1.3 End of Last Side

A. Initial Conditions

Tape stopped at end of side 4 (or last recorded side of cassette if not side 4) in either Play mode.

B. Operations

- 1. (U) Slide volume control to STOP.
 - 2. (M) Tape is rewound to the beginning of side 1.
 - 3. (M) End of tape.
 - 4. (M) Rewind is stopped.
 - 5. (M) "A" tone indicates rewind completed.
- a. (U/Optional) Slide volume control to VOLUME.
 - b. (M) "D" tone, followed 1 second later by an "A" tone, indicates that all sides of the tape have been played and tape should be removed.
 - c. (U/Optional) Press Review.
 - d. (M) No reaction from machine.

6.4.1.4 Unloading

A. Initial Conditions

At any point where tape is playing in either Play mode

or at end of last side.

B. Operations

1. (U) Open door.
2. (U) Slide volume control to STOP (unless already done as in "End of Last Side").
3. (U) Depress cassette until carriage unlocks and allow to rise.
4. (U) Remove cassette from elevator.

6.4.2 User Options During Operation of E-1

6.4.2.1 Loading

- A. Purpose
To interrupt auto-rewind.
- B. Initial Condition
Tape is in initial auto-rewind.
- C. Operations
1. (U) Open door.
 2. (M) Auto rewind stops.
 3. (U) Close door.
 4. (M) Auto rewind resumes.

6.4.2.2 Side Identification (N/A)

- A. Purpose
To identify side that is playing.
- B. Initial Condition
Tape is playing.
- C. Operations
1. (U) Depress Side button and then release within 2 seconds.
 2. (M) A number of "B" tones indicating the side number are heard over program material.
 3. (M) Play continues on that side.

6.4.2.3 Review

- A. Purpose
To review to a point in the side playing.
- B. Initial Condition
Tape is playing on any side.
- C. Operations
1. (U) Depress and hold Review button. An error tone will sound if not completely depressed.
 2. (M) Tape rewinds.
 3. (U) Release review button at desired point.

- 4. (M) Same side plays.
- D. Purpose
To review to the beginning of a side.
- E. Initial Condition
Tape is playing on any side.
- F. Operations
 - 1. (U) Depress and hold Review button. An error tone will sound if not completely depressed.
 - 2. (M) Tape rewinds.
 - 3. (M) End of tape.
 - 4. (M) Rewind is stopped.
 - 5. (M) "C" tone indicates end of tape.
 - 6. (U) Release Review button.
 - 7. (M) Same side plays.

6.4.2.4 Side Advancing (N/A)

None of Section 6.4.2.4 is accessible to the user unless side cover is removed.

- A. Purpose
To switch to the next sequential side.
- B. Initial Condition
Tape playing in either mode, stopped at end of side in manual mode, or stopped at end of last side in either mode.
- C. Operations
 - 1. (U) Depress and hold Side button for more than 2 seconds.
 - 2. (M) After 2 seconds a continuous `C` tone occurs. If tape is playing, machine will stop.
 - 3. (U) Release Side button.
 - 4. (M) Play direction is reversed.
 - 5. (M) A number of "B" tones indicates new side number.
 - 6. (M) New side plays.

6.4.2.5 Unplugging

- A. Purpose
Accidental unplugging, transportation of unit, power outage, or use of remote on/off control.
- B. Initial Condition
Tape is playing.
- C. Operations
 - 1. (U) Unplug unit/power off.
 - 2. (M) Rewind is stopped
 - 3. (U) Plug unit in/power restored
 - 4. (M) No apparent reaction from machine.
 - 5. (U) Slide volume control to VOLUME.
 - 6. (M) Play begins at point tape play was

interrupted.

- D. Initial Condition
Side advance pushed. (N/A)
- E. Operations
 - 1. (U) Slide volume control to STOP, push Review or open door.
 - 2. (M) Play is stopped and side advance switch is ignored.
 - 3. (U) Slide volume control to VOLUME and/or close door.
 - 4. (M) Unit returns to initial condition.
- F. Initial Condition
Side identification activated. (N/A)
- G. Operations
 - 1. (M) Side identification "B" tones are being generated
 - 2. (U) Slide volume control to STOP, push Review or open door.
 - 3. (M) Play is stopped and "B" tones stop.
 - 4. (U) Slide volume control to VOLUME, release Review and close door.
 - 5. (M) Unit returns to play condition.

6.4.2.7 Mechanical End of Tape (MEOT)

- A. Purpose
To provide a backup if the EOS fails.
- B. Initial Condition
End of a side in manual mode. (N/A)
- C. Operations
 - 1. (M) EOS unable to detect end of side.
 - 2. (M) Tape keeps playing on that side.
 - 3. (M) End of tape.
 - 4. (M) Play is stopped.
 - 5. (M) "A" tone indicates end of tape.
 - 6. (U) Press Side button and hold until "C" tone is heard, then release.
 - 7. (M) Play direction is reversed.
 - 8. (M) A number of "B" tones indicates a new side number.
 - 9. (M) New side plays.
- D. Initial Condition
End of a side in Automatic mode.
- E. Operations
 - 1. (M) EOS unable to detect end of side.
 - 2. (M) Tape keeps playing on that side.
 - 3. (M) End of tape.
 - 4. (M) Play direction is reversed.
 - 5. (M) New side plays.

- F. Initial Condition
End of last side in either play mode.
- G. Operations
 - 1. (M) EOS unable to detect end of the last side.
 - 2. (M) Tape keeps playing on that side.
 - 3. (M) End of tape.
 - 4. (M) Play is stopped.
 - 5. (M) "D" tone indicates end of last side.
 - a. (U/Optional) Press Side button momentarily.
(N/A)
 - b. (M) A series of "B" tones indicates the side number of the last side that played, followed 1 second later by a "D" tone indicating end of last side.
 - 6. (U) Slide volume control to STOP.
 - 7. (M) Tape is rewound to the beginning of side 1.
 - 8. (M) Rewind is stopped.
 - 9. (M) "A" tone indicates rewind completed.
 - a. (U/Optional) Slide volume control to VOLUME.
 - b. (M) "D" tone followed 1 second later by an "A" tone indicates that all sides of tape have been played and tape should be removed.
 - c. (U/Optional) Press Review or Side button.
(N/A)
 - d. (M) No reaction from machine.
 - e. (U) Slide volume control to STOP.
 - 10. (U) Unload cassette.
- H. Purpose
To stop tape in case of jam or breakage.
- I. Initial Condition
Tape playing in manual play mode. (N/A)
- J. Operations
 - 1. (M) Tape jams or breaks.
 - 2. (M) Play is stopped.
 - 3. (M) "A" tone indicates tape stoppage.
 - 4. (U) Press Side button and hold until "C" tone is heard, then release. (N/A)
 - 5. (M) A number of "B" tones indicates new side number.
 - 6. (M) Play direction reverses.
 - 7. (M) Tape is still jammed and no audio signal is detected.
 - 8. (M) After 0.5 second play is stopped.
 - 9. (M) "A" tone indicates tape stoppage and 1 second later than "D" indicates the tape should be removed.
 - a. (U/Optional) Press Side button momentarily.

- (N/A)
 - b. (M) A series of "B" tones indicates the side number of the last side the machine attempted to play, followed 1 second later by a "D" tone to indicate that tape should be removed.
 - 10. (U) Slide volume control to STOP
 - 11. (M) Tape rewind is attempted.
 - 12. (M) Tape is still jammed and does not move.
 - 13. (M) After 0.5 second rewind is stopped.
 - 14. (M) "A" tone indicates rewind is completed.
 - a. (U/Optional) Slide volume control to right.
 - b. (M) "D" tone followed 1 second later by an "A" tone indicates that tape should be removed.
 - c. (U/Optional) Press Review or Side button.
(N/A)
 - d. (M) No reaction from machine.
 - e. (U) Slide volume control to STOP
 - 15. (U) Open door.
 - 16. (U) Unload and repair cassette.
- K. Initial Condition
Tape playing in automatic play mode.
- L. Operations
 - 1. (M) Tape jams or breaks.
 - 2. (M) Play is stopped.
 - 3. (M) Play direction reverses.
 - 4. (M) Tape is still jammed and no audio signal is detected.
 - 5. (M) After 0.5 second play is stopped.
 - 6. (M) "A" tone indicates tape stoppage and 1 second later the "D" tone indicates the tape should be removed.
 - a. (U/Optional) Press Side button momentarily.
(N/A)
 - b. (M) A series of "B" tones indicates the side number of the last side the machine attempted to play, followed 1 second later by a "D" tone to indicate that tape should be removed.
 - 7. (U) Slide volume control to STOP.
 - 8. (M) Tape rewind is attempted.
 - 9. (M) Tape is still jammed and does not move.
 - 10. (M) After 0.5 second rewind is stopped.
 - 11. (M) "A" tone indicates rewind completed.
 - a. (U/Optional) Slide volume control to VOLUME.
 - b. (M) "D" tone followed 1 second later by an "A" tone indicates that tape should be removed.

- c. (U/Optional) Press Review or Side button.
(N/A)
 - d. (M) No reaction from machine.
 - e. (U) Slide volume control to STOP.
 - 12. (U) Open door.
 - 13. (U) Unload and repair cassette.
 - M. Initial Condition
(M) Tape jammed or broken before tape begins to play in either manual or automatic mode.
 - N. Operation
 - 1. (M) No audio signal is detected.
 - 2. (M) After 0.5 second "A" tone indicates tape stoppage and 1 second later the "D" tone indicates the tape should be removed.
 - a. (U/Optional) Press Side Button momentarily.
(N/A)
 - b. (M) A series of "B" tones indicates the side number of the last side the machine attempted to play, followed 1 second later by a "D" tone indicating that the tape should be removed.
 - 3. (U) Unload and repair cassette.
- 6.4.2.8 End of Last Side and Unloading
- A. Purpose
To defeat the auto rewind at the end of last side.
 - B. Initial Condition
Play just stopped in last side.
 - C. Operations
 - 1. (U) Open door.
 - 2. (U) Slide volume control to OFF.
 - 3. (U) Depress carriage and remove cassette.
 - D. Initial Condition
Auto rewind at end of last side in progress.
 - E. Operations
 - 1. (U) Open door.
 - 2. (M) Rewind is stopped.
 - 3. (U) Depress carriage and remove cassette.